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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,017	02/05/2004	Joseph Z. Lu	120 06798US	5322

128 7590 11/27/2007

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EXAMINER	
LO, SUZANNE	

ART UNIT	PAPER NUMBER
2128	

MAIL DATE	DELIVERY MODE
11/27/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/773,017	LU, JOSEPH Z.	
	Examiner	Art Unit	
	Suzanne Lo	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-27 have been presented for examination and the request for continued examination has been acknowledged.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The MPEP 2106.02 states: Mathematical Algorithms

> Claims to processes that do nothing more than solve mathematical problems or manipulate abstract ideas or concepts are complex to analyze and are addressed herein. If the "acts" of a claimed process manipulate only numbers, abstract concepts or ideas, or signals representing any of the foregoing, the acts are not being applied to appropriate subject matter. Gottschalk v. Benson, 409 U.S. 63, 71 - 72, 175 USPQ 673, 676 (1972). Thus, a process consisting solely of mathematical operations, i.e., converting one set of numbers into another set of numbers, does not manipulate appropriate subject matter and thus cannot constitute a statutory process.
>
> In practical terms, claims define nonstatutory processes if they:
>
> – consist solely of mathematical operations without some claimed practical application (i.e., executing a "mathematical algorithm"); or
>
> – simply manipulate abstract ideas, e.g., a bid (Schrader, 22 F.3d at 293-94, 30 USPQ2d at 1458-59) or a bubble hierarchy (Warmerdam, 33 F.3d at 1360, 31 USPQ2d at 1759), without some claimed practical application.

2. Claim 1-27 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 26 given the broadest reasonable interpretation exists as software only (See [0017]-[0020] of Specification of instant application) and thus is directed towards software *per se* which is nonstatutory. Additionally, claims 1-27 are directed are directed towards a mathematical

algorithm which only manipulates numbers and signals without being applied to appropriate subject matter with no claimed practical application.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Repucci et al. (U.S. Patent Application Publication No. 2005/0015205 A1) in view of Swinnen et al. ("Detection and multichannel SVD-based filtering of trigeminal somatosensory evoked potentials").**

As per claim 27, Repucci is directed to a method, comprising: performing canonical QR-decomposition on a matrix, the canonical QR-decomposition creating an orthogonal matrix and an upper triangular matrix (**[0010], [0073], page 8, [0101]**); using the orthogonal matrix and the upper triangular matrix to at least partially isolate one or more effects of one or more disturbances in a signal (**[0012] and [0096]-[0097]**); wherein the upper triangular matrix has a plurality of values along a diagonal of the upper

triangular matrix, each value being greater than or equal to zero, the diagonal lying between an upper left corner and a lower right corner of the upper triangular matrix as these limitations are the inherent to an upper triangular matrix from a canonical QR-decomposition but fails to explicitly disclose wherein the matrix comprises a first column Hankel matrix in a first portion of the matrix and a second column Hankel matrix in a second portion of the matrix.

Swinnen teaches a matrix that comprises a first column Hankel matrix in a first portion of the matrix and a second column Hankel matrix in a second portion of the matrix **(page 302, 2nd column, "Concatenate the K Hankel matrices...")**. It would have been obvious at the time of the invention to an ordinary person skilled in the art to combine the matrix manipulation method of Repucci with the Hankel matrix of Swinnen in order to improve the signal to noise ration and extraction of the characteristic components of the original signal **(Swinnen, page 301, Section 4.2, 1st paragraph)**.

4. **Claims 1-5, 11-14, and 18-21 and 26** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kadambe (U.S. Patent Application Publication No. 2003/0061035 A1) in view of Repucci et al. (U.S. Patent Application Publication No. 2005/0015205 A1) in further view of Swinnen et al. ("Detection and multichannel SVD-based filtering of trigeminal somatosensory evoked potentials").**

As per claim 1, Kadambe is directed to a method, comprising: receiving a matrix comprising a first plurality of samples associated with a first signal and a second plurality of samples associated with a second signal, the second signal comprising a first portion associated with the first signal and a second portion associated with at least one disturbance **([0021], mixed signal matrix X)**; and projecting the matrix using the projected matrix to at least partially isolate the first portion of the second signal from the second portion of the second signal **([0021], estimate matrix S)** but fails to explicitly disclose projecting the matrix into an orthogonal space.

Repucci teaches projecting a matrix into an orthogonal space by performing canonical QR-decomposition on the matrix with an orthogonal matrix and an upper triangular matrix **([0010], [0073], page 8, [0101])**. Kadambe and Repucci are analogous art because they are from the same field of endeavor, modeling and separating mixed signals. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method of separating signals of Kadambe with the matrix projection method of Repucci in order to minimize error in the modeled signals **(Repucci, page 8, [0101])**.

The combination of Kadambe and Repucci fails to explicitly disclose wherein the matrix comprises a first column Hankel matrix comprising the first plurality of samples in a first portion of the matrix and a second column Hankel matrix comprising the second plurality of samples in a second portion of the matrix. Swinnen teaches a matrix that comprises a first column Hankel matrix comprising a first plurality of samples in a first portion of the matrix and a second column Hankel matrix comprising a second plurality of samples in a second portion of the matrix **(page 302, 2nd column, "Concatenate the K Hankel matrices...")**. It would have been obvious at the time of the invention to an ordinary person skilled in the art to combine the matrix manipulation method of Kadambe and Repucci with the Hankel matrix of Swinnen in order to improve the signal to noise ration and extraction of the characteristic components of the original signal **(Swinnen, page 301, Section 4.2, 1st paragraph)**.

As per claim 2, Kadambe the combination of Kadambe and Repucci already discloses the method of claim 1 wherein projecting the matrix comprises performing canonical QR-decomposition on the matrix, the canonical QR-decomposition creating an orthogonal matrix and an upper triangular matrix **(Repucci, [0010], [0073], page 8, [0101])**.

As per claim 3, the combination of Kadambe, Repucci, and Swinnen already discloses the method of claim 2, wherein: the upper triangular matrix has a plurality of values along a diagonal of the matrix, each value being greater than or equal to zero; and the diagonal lies between an upper left corner

and a lower right corner of the upper triangular matrix as the limitations are the inherent to an upper triangular matrix from a canonical QR-decomposition.

As per claim 4, the combination of Kadambe, Repucci, and Swinnen already discloses the method of claim 1, wherein projecting the matrix comprises projecting the first signal along with the second signal **(Kadambe, [0021])**.

As per claim 5, the combination of Kadambe, Repucci, and Swinnen is directed to the method of claim 1, further comprising generating the matrix comprising *the first and second plurality of samples* **(Repucci, [0010], [0073], page 8, [0101])**.

As per claim 11, Kadambe is directed to an apparatus, comprising: at least one memory stori*ng* a matrix comprising a first plurality of samples associated with a first signal and a second plurality of samples associated with a second signal, the second signal comprising a first portion associated with the first signal and a second portion associated with at least one disturbance **([0021], mixed signal matrix X)** but fails to disclose and at least one processor perform*ing* canonical QR-decomposition on the matrix, the canonical QR-decomposition creating an orthogonal matrix and an upper triangular matrix, the upper triangular matrix having a plurality of values along a diagonal of the matrix, each value being greater than or equal to zero, the diagonal lying between an upper left corner and a lower right corner of the upper triangular matrix.

Repucci teaches projecting a matrix by performing canonical QR-decomposition on the matrix with an orthogonal matrix and an upper triangular matrix **([0010], [0073], page 8, [0101])**. Kadambe and Repucci are analogous art because they are from the same field of endeavor, modeling and separating mixed signals. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method of separating signals of Kadambe with the matrix projection method of Repucci in order to minimize error in the modeled signals **(Repucci, page 8, [0101])**.

The combination of Kadambe and Repucci fails to explicitly disclose wherein the matrix comprises a first column Hankel matrix comprising the first plurality of samples in a first portion of the matrix and a second column Hankel matrix comprising the second plurality of samples in a second portion of the matrix. Swinnen teaches a matrix that comprises a first column Hankel matrix comprising a first plurality of samples in a first portion of the matrix and a second column Hankel matrix comprising a second plurality of samples in a second portion of the matrix **(page 302, 2nd column, "Concatenate the K Hankel matrices...")**. It would have been obvious at the time of the invention to an ordinary person skilled in the art to combine the matrix manipulation method of Kadambe and Repucci with the Hankel matrix of Swinnen in order to improve the signal to noise ration and extraction of the characteristic components of the original signal **(Swinnen, page 301, Section 4.2, 1st paragraph)**.

As per claim 12, the combination of Kadambe, Repucci, and Swinnen already discloses the apparatus of claim 11, wherein performing the canonical QR-decomposition **(Repucci, [0010], [0073], page 8, [0101])** allows the at least one processor to project the matrix so as to at least substantially separate the first portion of the second signal from the second portion of the second signal **(Kadambe, [0021], estimate matrix S)**.

As per claim 13, the combination of Kadambe, Repucci, and Swinnen already discloses the apparatus of claim 12, wherein the at least one processor is operable to generate a projection that includes the first signal, the first portion of the second signal, and the second portion of the second signal **(Kadambe, [0021], estimate matrix S)**.

As per claim 14, the combination of Kadambe, Repucci, and Swinnen is directed to the apparatus of claim 11, wherein the at least one processor is further operable to generate the matrix **(Repucci, [0010], [0073], page 8, [0101])**.

As per claims 18-21, the combination of Kadambe, Repucci, and Swinnen is directed to a computer program embodied on a computer readable medium, the computer program comprising

computer readable program code for method steps with the same limitations as claims 1-4 and are therefore rejected under the same art combination.

As per claim 26, Kadambe is directed to a system, comprising: a monitored system **(Figure 3, 300, Data Processing System)** operable to receive a first signal and provide a second signal, the second signal comprising a first portion associated with the first signal and a second portion associated with at least one disturbance **([0021], mixed signal matrix X)**; and a controller **(Figure 3, 306, signal processor)** operable to: produce a matrix comprising a first plurality of samples associated with the first signal and a second plurality of samples associated with the second signal **([0021], mixed signal matrix X)**; and decompose the matrix so as to form a projection, and use the projection to at least partially isolate the first portion of the second signal from the second portion of the second signal **([0021], estimate matrix S)** but fails to explicitly disclose decompose the matrix as to form a projection in an orthogonal space.

Repucci teaches projecting a matrix by performing canonical QR-decomposition on the matrix with an orthogonal matrix and an upper triangular matrix **([0010], [0073], page 8, [0101])**. Kadambe and Repucci are analogous art because they are from the same field of endeavor, modeling and separating mixed signals. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the system of separating signals of Kadambe with the matrix projection system of Repucci in order to minimize error in the modeled signals **(Repucci, page 8, [0101])**.

The combination of Kadambe and Repucci fails to explicitly disclose wherein the matrix comprises a first column Hankel matrix comprising the first plurality of samples in a first portion of the matrix and a second column Hankel matrix comprising the second plurality of samples in a second portion of the matrix. Swinnen teaches a matrix that comprises a first column Hankel matrix comprising a first plurality of samples in a first portion of the matrix and a second column Hankel matrix comprising a second plurality of samples in a second portion of the matrix **(page 302, 2nd column, "Concatenate the**

K Hankel matrices..."). It would have been obvious at the time of the invention to an ordinary person skilled in the art to combine the matrix manipulation method of Kadambe and Repucci with the Hankel matrix of Swinnen in order to improve the signal to noise ration and extraction of the characteristic components of the original signal **(Swinnen, page 301, Section 4.2, 1st paragraph)**.

Allowable Subject Matter

5. Claims 6-10, 15-17, and 22-25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and the 101 issues are resolved. The reasons for allowance are held in abeyance until all other outstanding rejections in regards to the instant application are resolved.

Response to Arguments

6. Applicant's arguments filed 09/07/07 have been fully considered but they are not persuasive.

7. The 35 U.S.C. 101 rejections of claims 1-27 are maintained. Claim 26 given the broadest reasonable interpretation exists as software only (See [0017]-[0020] of Specification of instant application) and thus is directed towards software *per se* which is nonstatutory. The controller can be entirely embodied as software ([0020]) and the monitored system while it may *represent* any type of system ([0017]-[0018]) including hardware systems such as a manufacturing plant, it is not enabled nor embodied explicitly as a hardware system such as manufacturing plant. Thus, given the broadest reasonable interpretation the monitored system may represent a software only system and be embodied only as software. Additionally, claims 1-27 are directed are directed towards a mathematical algorithm which only manipulates numbers and signals without being applied to appropriate subject matter with no claimed practical application. Furthermore, claims 11-25 contain intended use language such as the phrases "program for" and any limitations following these phrases are not given patentable weight; thus

claims 18-25 are fully anticipated by any computer. The Applicant is advised that claim 26 appears to have similar deficiencies with the phrases "operable to".

8. The claim objections and the 35 U.S.C. 112 rejections have been withdrawn due to the amendments.

9. The 35 U.S.C. 102 rejection of claims 11-25 have been withdrawn due to the amended claims.

10. In response to Applicant's arguments that there is no motivation to combine Swinnen with Kadambe or Repucci as the previous Office Action fails to explain how or why the use of Hankel matrices in Swinnen could be incorporated into the techniques of Kadambe or Repucci. The explanation of how and why the use of Swinnen can be fully incorporated into the techniques of Kadambe or Repucci are as follows. While Applicant argues that Swinnen does not project the Hankel matrix into an orthogonal space or perform a canonical QR decomposition of said matrix, it is well known in the art that SVD inherently involves decomposition into orthogonal matrices, as evidenced by Strang, "Introduction to Linear Algebra" ("The Singular Value Decomposition (SVD) has orthogonal matrices U and V.", page 354). Furthermore, it is well known in the art that QR decompositions are coupled with SVD algorithms in order to identify relevant information for prediction as evidenced by Salmeron et al. ("SSA, SVD, QR-cp and RBF Model Reduction", page 589, Introduction, pages 591-592, Section 2) and Blackford "Singular Value Decomposition (page 2, "it may be more efficient to first perform a QR factorization") and Bochkanov et al. "Singular value decomposition" (page 2, inclusion of QR decomposition within SVD algorithm), thus Swinnen renders obvious using the projected matrix, an orthogonal matrix, and an upper triangular matrix and the projection of the matrix to at least partially isolate one portion of a signal from another portion of the signal or to at least isolate one or more disturbance effects in the signal (Swinnen, transient identification and extraction, Figure 9, page 302).

11. The Applicant's arguments regarding the prior art rejections of claims 6-7, 15, 22-23 are persuasive and said prior art rejections have been withdrawn.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

12. The prior art made of record is not relied upon because it is cumulative to the applied rejection. These references include:

1. U.S. Patent No. 6,615,164 B1 issued to Gopisetty et al. on 09/02/03.

2. U.S. Patent Application Publication 2004/0071207 A1 issued to Skidmore et al. on 04/16/04.

3. U.S. Patent No. 7,035,357 B2 issued to Bonhomme on 04/25/06.

4. "Matrix-vector Product for Confluent Cauchy-like Matrices with Application to Confluent Rational Interpolation" published by Olshevsky et al. in 2000.

5. "On- and off-line identification of linear state-space models" published by Moonen et al. in 1989.

6. "A Note on Minors of a Generalized Hankel Matrix" published by Usefi et al. in 2003.

7. "Numerical Linear Algebra for Signal Systems and Control" published by Dooren, P in 04/24/03.

13. All Claims are rejected.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Suzanne Lo whose telephone number is (571)272-5876. The examiner can normally be reached on M-F, 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on (571)272-2297. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Suzanne Lo
Patent Examiner
Art Unit 2128

SL
11/15/07

KAMINI SHAH
SUPERVISORY PATENT EXAMINER